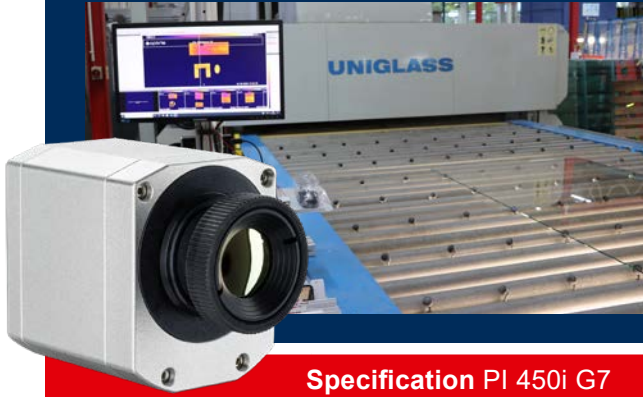


High performance Bottom up glass inspection system for process control in glass tempering machines



Features

- Compact bottom up system for coating independent underneath measurement
- Superb 955 px resolution on maximum 3.4 m scan width (@ 90 cm distance)
- Integrated ultra-fast glass breakage detection combined with Digitally controlled lens protection system (DCLP)
- No cooling or air purge requirement
- Glass area calculation
- Pre-assembled system for easy installation on glass tempering furnaces

Specification PI 450i G7

Optical resolution	382 x 288 pixels
Detector	FPA, uncooled (17 μm x 17 μm)
Spectral range	7.9 μm
Temperature ranges	150 ... 900 °C, 200 ... 1500 °C
Sighting range	0 ... 250 °C
Frame rate	80 Hz / switchable to 27 Hz
Optics (FOV)	80° x 54° FOV / f = 5.7 mm or 53° x 38° FOV / f = 7.7 mm max. FOV: 96° / 955 pixels per scan line ¹⁾ 3.4 m scan width @ 90 cm distance
Thermal sensitivity (NETD) ²⁾	150 mK (at T _{Obj} = 650 °C)
Accuracy	±2 °C or ±2 %, whichever is greater
PC interface	USB 2.0 / USB to GigE (PoE) interface
Process interface (PIF), industrial	2x 0 – 10 V input, digital input (max. 24 V), 3x 0/4 – 20 mA output, 3x relais (0 – 30 V / 400 mA), fail-safe relay
Ambient temperature	0 ... 70 °C
Relative humidity	20 – 80 %, non-condensing
Enclosure (size / rating)	46 x 56 x 68 – 77 mm (depending on lens + focus position) / IP 67 (NEMA)
Weight	237 - 251 g (depending on lens)
Vibration	IEC 60068-2-6 / -64
Shock	IEC 60068-2-27 (25 G and 50 G)

Specification glass breakage sensor CTlaser 4ML

Temperature range	0 °C ... 500 °C
Spectral range	2.2 - 6 μm
Optical resolution (90 % energy)	30:1
System accuracy ³⁾ (at T _{Amb} 23 ±5 °C)	± (0.3% of reading +2 °C)
Temperature resolution (NETD) ⁴⁾	120 mK
Exposure time	90 μs (90% signal)
Response time	300 μs (90% signal)
Emissivity/ Gain (adjustable via programming keys or software)	0.100 – 1.100
Environmental rating	IP 65 (NEMA-4)
Ambient temperature ⁵⁾	-20 °C ... 70 °C (sensing head: 50 °C with laser on) 0 °C ... 85 °C (electronics)
Vibration (sensor)	IEC 60068-2-6 / -64
Shock (sensor)	IEC 60068-2-27 (25 G and 50 G)
Weight	600 g (sensing head) 420 g (electronics)

- 1) With 80° optics and usage of a diagonal scan line; maximum pixel count based on two cameras without overlapping
 2) Measurement of the noise equivalent temperature difference (NETD) according to VDI 5585 standard, method B; 650 °C black body temperature, frame rate 20 Hz averaged
 3) ϵ = 1, response time 1 s
 4) At time constant 1 ms and T_{Obj} = 50 °C
 5) The functioning of the LCD display may be limited at ambient temperatures below 0 °C

Scope of supply Bottom Up GIS 450i G7

- 2x PI 450i G7 imager with 80° or 53° FOV
- 2x Industrial Process Interface
- CTlaser 4ML glass breakage sensor with USB interface
- 2x DCLP Shutter system with mounting brackets for imagers
- 2x USB Server Gigabit
- Control cabinet with cable set (10 m each) and remote control box
- Software package
- 100-230 V AC / 24 V DC power supply for initial start-up



TECHNICAL DATA

The diagram illustrates the glass tempering process. A glass sheet is shown moving from left to right through two main stages: a heating process at 600 °C and a cooling process at 50 °C. A glass breakage sensor is located at the transition point between the heating and cooling stages. Two infrared cameras are positioned to monitor the glass during the cooling process.



The diagram illustrates the electrical and data connections for the experimental setup. A power supply (100-230 VAC / 24 VDC / 3A) provides power to the system. A remote control (Shutter open) is connected to the system via a 10 m cable. The system includes a USB server, PIF (PIF), and Shutter components. The USB server is connected to the PIF and the Shutter. The PIF is connected to the Shutter. The Shutter is connected to the CTIaser 4ML glass breakage sensor. The USB server is also connected to the PI 450i G7 with shutter. The PIF is connected to the PI 450i G7 with shutter. The Shutter is connected to the PI 450i G7 with shutter. The CTIaser 4ML glass breakage sensor is connected to the PI 450i G7 with shutter. The system is housed in an Electric cabinet. The connections are color-coded: blue for power, green for USB, black for PIF, and red for the shutter signal. The diagram also shows a 12 V and 24 V power source connected to the USB server. The USB, PIF, and shutter cables are 10 m each. The Ethernet, Cat 6, 10 m cable is also shown. The PI 450i G7 with shutter is connected to the USB, PIF, and shutter cables. The CTIaser 4ML glass breakage sensor is connected to the PI 450i G7 with shutter via a 10 m cable. The Shutter signal is connected to the Shutter component via a 10 m cable. The USB server is connected to the USB cables. The PIF is connected to the PIF cables. The Shutter is connected to the shutter cables. The CTIaser 4ML glass breakage sensor is connected to the PI 450i G7 with shutter via a 10 m cable. The PI 450i G7 with shutter is connected to the USB, PIF, and shutter cables. The Shutter signal is connected to the Shutter component via a 10 m cable. The USB server is connected to the USB cables. The PIF is connected to the PIF cables. The Shutter is connected to the shutter cables. The CTIaser 4ML glass breakage sensor is connected to the PI 450i G7 with shutter via a 10 m cable.

90.0
50.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
-90.0

Glass area
3,5m²

Area 1
617,1°C

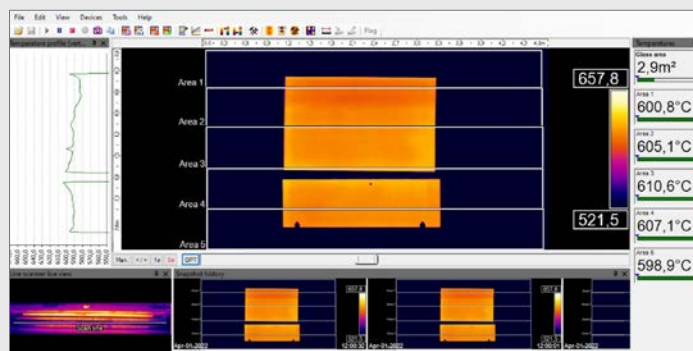
Area 2
618,5°C

Area 3
622,4°C

Area 4
624,8°C

Area 5
615,5°C

The software provides excellent image quality and manifold analysis features as profiles, measurement areas and alarm indication



Exemplary software layout with thermal profile, IR live view, snapshot history, five measurement zones and glass area calculation